Claims

What is claimed is:

1. A multilayered stack, comprising:

a first dielectric layer that includes a first liquid crystal polymer (LCP) dielectric material, wherein a first electrical circuitization is on and in direct mechanical contact with a surface of the first dielectric layer; and

a second dielectric layer that includes a second LCP dielectric material, wherein a first electrically conductive plug includes a first electrically conductive material and extends through a thickness of the second dielectric layer, wherein a second electrical circuitization is on and in direct mechanical contact with a surface of the second dielectric layer, wherein the second electrical circuitization is in direct mechanical and electrical contact with a first end of the first electrically conductive plug, wherein the second dielectric layer is directly bonded to the first dielectric layer with no extrinsic adhesive material bonding the second dielectric layer to the first dielectric layer, wherein the second dielectric layer is directly bonded to the first electrical circuitization with no extrinsic adhesive material bonding the second dielectric layer to the first electrical circuitization, and wherein the first electrically conductive plug is fluxlessly soldered to the first electrical circuitization.

2. The multilayered stack of claim 1, wherein the first LCP dielectric material has a polymer

chain structure and associated directional orientation that is essentially the same as the polymer chain structure and associated directional orientation that existed in the first LCP dielectric material prior to the bonding of the second dielectric layer to the first dielectric layer, and wherein the second LCP dielectric material has a polymer chain structure and associated directional orientation that is essentially the same as the polymer chain structure and associated directional orientation that existed in the second LCP dielectric material prior to the bonding of the second dielectric layer to the first dielectric layer.

3. The multilayered stack of claim 1, wherein the first LCP dielectric material has a coefficient of thermal expansion (CTE) that is essentially the same as the CTE that existed in the first LCP dielectric material prior to the bonding of the second dielectric layer to the first dielectric layer, and wherein the second LCP dielectric material has a CTE that is essentially the same as the CTE that existed in the second LCP dielectric material prior to the bonding of the second dielectric layer to the first dielectric layer.

4. The multilayered stack of claim 1, wherein the first LCP dielectric material and the second LCP dielectric material are a same LCP dielectric material.

5. The multilayered stack of claim 1, wherein the first LCP dielectric material and the second LCP dielectric material are different LCP dielectric materials.

6. The multilayered stack of claim 1, further comprising a third dielectric layer that includes a

third LCP dielectric material, wherein a second electrically conductive plug includes a second electrically conductive material and extends through a thickness of the third dielectric layer, wherein a third electrical circuitization is on and in direct mechanical contact with a surface of the third dielectric layer, wherein the third electrical circuitization is in direct mechanical and electrical contact with a first end of the second electrically conductive plug, wherein the third dielectric layer is directly bonded to the second dielectric layer with no extrinsic adhesive material bonding the third dielectric layer to the second dielectric layer, wherein the third dielectric layer is directly bonded to the second electrical circuitization with no extrinsic adhesive material bonding the third dielectric layer to the second electrical circuitization, and wherein the second electrically conductive plug is fluxlessly soldered to the second electrical circuitization.

7. The multilayered stack of claim 6, wherein the first LCP dielectric material, the second LCP dielectric material, and the third dielectric material are a same LCP dielectric material.

8. The multilayered stack of claim 6, wherein the first LCP dielectric material, the second LCP dielectric material, and the third dielectric material are different LCP dielectric materials.

9. The multilayered stack of claim 6, wherein two dielectric materials of the first, second, and third LCP dielectric materials are a same LCP dielectric material leaving a remaining LCP dielectric material of the first, second, and third LCP dielectric materials, and wherein the

remaining LCP dielectric material differs from said same LCP dielectric material.

10. The multilayered stack of claim 1, wherein the multilayered stack does not include a through hole through a total thickness of the multilayered stack.

11. A method for forming a multilayered stack, comprising the steps of:

forming a first dielectric layer that includes a first liquid crystal polymer (LCP) dielectric material, wherein a first electrical circuitization is on and in direct mechanical contact with a surface of the first dielectric layer;

forming a second dielectric layer that includes a second LCP dielectric material, wherein a first electrically conductive plug includes a first electrically conductive material and extends through a thickness of the second dielectric layer, wherein a second electrical circuitization is on and in direct mechanical contact with a surface of the second dielectric layer, wherein the second electrical circuitization is in direct mechanical and electrical contact with a first end of the first electrically conductive plug;

fluxlessly soldering the first electrically conductive plug to the first electrical circuitization; and

subjecting the first dielectric layer, the second dielectric layer, and the first electrical circuitization to a temperature less than the lowest nematic-to-isotropic transition temperature of the first and second LCP dielectric materials, for a dwell time and at an elevated pressure that is sufficient to cause the first and second LCP dielectric materials to plastically deform and directly bond the second dielectric layer to the first dielectric layer and directly bond the second dielectric layer to the first electrical circuitization with no extrinsic adhesive material disposed between the second dielectric layer and the first dielectric layer and with no extrinsic adhesive material disposed between the second dielectric layer and the first electrical circuitization.

12. The method of claim 11, wherein the step of subjecting the first dielectric layer is performed after the fluxlessly soldering step.

13. The method of claim 11, wherein the step of subjecting the first dielectric layer is performed simultaneous with the fluxlessly soldering step.

14. The method of claim 11, wherein the polymer chain structure and associated directional orientation of the first and second LCP dielectric materials remains essentially unchanged throughout the dwell time.

15. The method of claim 11, wherein the coefficient of thermal expansion (CTE) of the first and second LCP dielectric materials remains essentially unchanged throughout the dwell time.

16. The method of claim 11, wherein the elevated pressure is in a range of about 1000 psi to about 3000 psi.

17. The method of claim 11, wherein the dwell time is at least about 2 minutes.

18. The method of claim 11, wherein the first LCP dielectric material and the second LCP dielectric material are a same LCP dielectric material.

19. The method of claim 11, wherein the first LCP dielectric material and the second LCP dielectric material are different LCP dielectric materials.

20. The method of claim 11, wherein the fluxlessly soldering step leaves a void volume between the first and second LCP dielectric layers, and wherein the subjecting step causes the void volume to be filled by at least one of the first and second LCP dielectric materials.